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Supplemental Data

Disruption of Large-Scale Brain Systems in Advanced Aging

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SUPPLEMENTAL MATERIAL

Additional control analyses

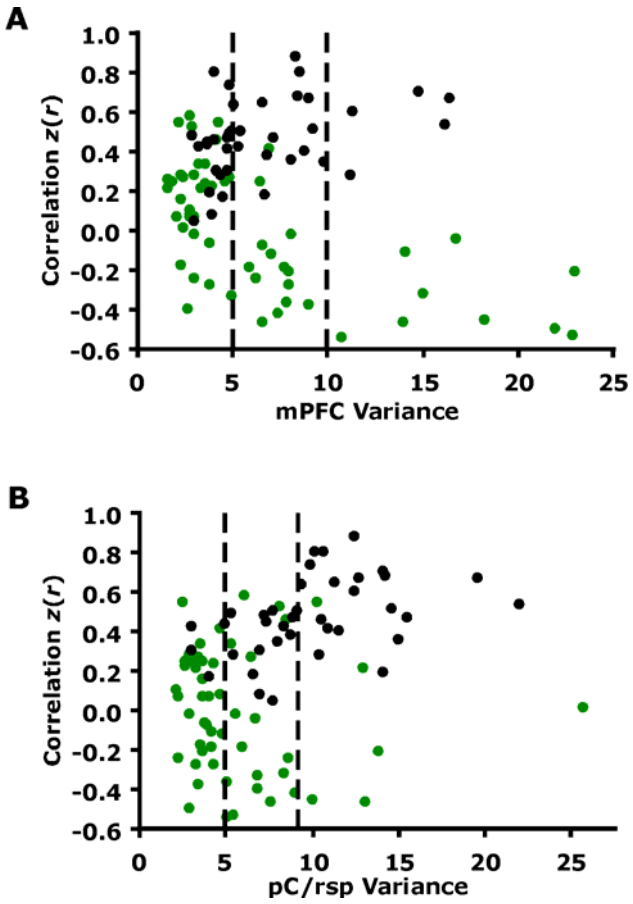
Systematic group differences in variance of the BOLD signal are an important consideration when interpreting reduced functional correlations in aging. To explore this influence, we controlled for the effect of variance on functional correlations by including medial prefrontal cortex (mPFC) variance and posterior cingulate/retrosplenial (pC/rsp) variance as separate regressors in a regression model with functional correlations and performed an independent samples *t*-test on the residuals (see main text). We found that after controlling for the effect of pC/rsp and mPFC variance on functional correlations, the two age groups still differed with respect to their anterior-posterior functional correlations at a statistically significant level. Here we expand further on these analyses.

Supplementary figure 1 illustrates an alternative way to examine whether group differences in variance fully account for group differences in functional correlations. Figure 1a is a scatterplot of the mPFC-pC/rsp Fischer's z-transformed correlation coefficient $z(r)$ and time course variance within the mPFC for all participants. Although both groups exhibit similar mean mPFC variances (young: 6.68, old: 6.37; independent samples *t*-test: $p = 0.76$; also see **Fig 3**), the young group consistently exhibits higher functional correlations than the old group. The effect can be seen most clearly within the dotted lines: although the young and older adults within these lines exhibit similar variances (young: 7.64, old: 7.17; independent samples *t*-test: $p = 0.30$), there is a robust dissociation in functional correlations (young: $r = 0.53$, old: -0.15; independent samples *t*-test: $p < 0.001$). Thus, the effect of mPFC variance cannot fully account for group differences in functional correlations.

Next we examined whether variance differences within the pC/rsp might explain age-related reductions in functional correlations. Figure 1b is a scatterplot of the mPFC-pCRsp Fischer's z-transformed correlation coefficient $z(r)$ and time course variance within the pC/rsp for all participants. Two main points can be concluded from this scatterplot. First, young adults, on average, exhibit higher time course variances within the pC/rsp than old adults (young: 9.93, old: 5.60; $p < 0.001$; also see Fig 3). Second, this difference does not fully account for group differences in functional correlations. Data within the dotted lines represent young and old adults matched on pC/rsp variance (young: 7.22, old: 6.71; $p = 0.26$). Despite their matched variance, the young individuals exhibit significantly higher anterior-posterior functional correlations than the old individuals (young: $r = 0.35$, old: -0.05; independent samples t-test: $p < 0.001$).

Supplementary Figure 1. Group differences in variance do not account for age-related changes in functional correlations.

A. The mPFC-pC/rsp Fischer's z-transformed correlation coefficient *z*(*r*) is plotted against time course variance within the mPFC for all participants. Data from young participants are colored in black and data from older participants are colored in green. Data within the dotted lines represent a range of variances for which both groups are matched (see text). Within this range it is clear that younger adults exhibit higher mPFC-pC/rsp functional correlations than older adults. **B.** The mPFC-pC/rsp Fischer's z-transformed correlation coefficient *z*(*r*) is plotted against time course variance within the pC/rsp for all participants. Data from young participants are colored in black and data from older participants are colored in green. Data within the dotted lines represent a range of variances for which both groups are matched (see text). Within this range it is clear that younger adults exhibit higher mPFC-pC/rsp functional correlations than older adults.



Supplementary Figure 2. White matter region of interest. The white matter ROI described in the main article is shown here spanning several slices (z = 20 to z = 40) and is overlaid on the mean anisotropy image from the 44 older adults for which diffusion tensor imaging (DTI) was available.